



ocket No.: 61282-071

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Customer Number: 20277
Anthony David King SMITH : Confirmation Number: 3817
Serial No.: 10/813,616 : Group Art Unit: 2181
Filed: March 31, 2004 : Examiner:
For: INTERFACING A REMOVABLE DEVICE WITH A DIGITAL PRODUCT

TRANSMITTAL OF CERTIFIED PRIORITY DOCUMENT

Mail Stop CPD
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

At the time the above application was filed, priority was claimed based on the following application:

Great Britain Patent Application No. 0307450.7, filed on March 31, 2003.

A copy of each priority application listed above is enclosed.

Respectfully submitted,

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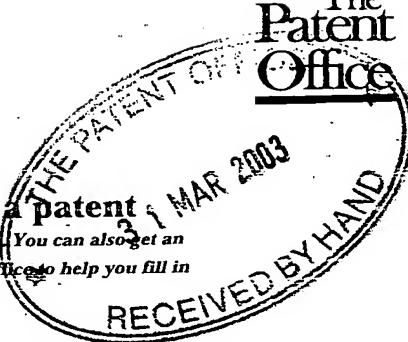
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The Patent Office

Cardiff Road
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South Wales
NP9 1RH

1. Your reference

ABC/21273

2. Patent application number
(The Patent Office will fill in this part)

0307450.7

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

Matsushita Electric Industrial Co. Ltd.

1006 Oaza Kadoma
Kadoma-shi
Osaka 571-8501
Japan
a Japanese company

S91842002

Patents ADP number (*if you know it*)

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

Method for Interfacing Storage Devices

5. Name of your agent (*if you have one*)

A A THORNTON & CO

"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)235 HIGH HOLBORN
LONDON WC1V 7LEPatents ADP number (*if you know it*)

0000075001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
(*if you know it*)Date of filing
(*day / month / year*)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(*day / month / year*)8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer 'Yes' if:*
a) *any applicant named in part 3 is not an inventor, or*
b) *there is an inventor who is not named as an applicant, or*
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Yes

Patents Form 1/77

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Description	5
Claim(s)	2
Abstract	-
Drawing(s)	1 <i>41</i>

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Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (<i>Patents Form 7/77</i>)	2
Request for preliminary examination and search (<i>Patents Form 9/77</i>)	1
Request for substantive examination (<i>Patents Form 10/77</i>)	-
Any other documents (please specify)	-

11. I/We request the grant of a patent on the basis of this application.

Signature *A.A.Thornton & Co.* Date
A. A. Thornton & Co. 31.03.03

12. Name and daytime telephone number of person to contact in the United Kingdom

Andrew B. CRAWFORD - 020 7440 6854

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METHOD FOR INTERFACING STORAGE DEVICES

The present invention relates to a method for interfacing storage devices and more particularly to a method which is suitable for use with portable devices.

5 Many portable devices are now being manufactured with external memory slots to allow the user to upgrade their device with additional memory and/or software after purchase. The SD card is an excellent example of this technology, and slots capable of accepting SD cards are now found on many items of equipment including PDAs, mobile phones, audio players, digital cameras, 10 camcorders and other consumer electronics products whether mobile or not. Other formats such as MMC, CompactFlash and SmartMedia are similar in their capabilities.

The use of an SD card has recently been expanded beyond its original use in order to provide I/O functions such as adding Bluetooth to PDAs.

15 While the use of external memory cards for input/output functions is generally advantageous, up to now it has required the user to upgrade the software in the device in order to provide a driver program associated with the CPU of the main device. This usually requires the main device to be connected to a computer so that the software associated with the main device can be modified to include the 20 appropriate driver.

It is an object of the present invention to provide a method which will permit I/O subsystems to be utilised which require no special low-level drivers to be written in order to access the full functionality.

The present invention provides a method for interfacing a removable 25 memory device with a main device such that a program contained on the removable memory device will have its functions mapped into a series of simple file system calls that are already provided with the main device.

The advantage of this arrangement is that applications can be written and stored on a removable memory device that are very easily ported from one platform to another even if different operating systems are used since the applications only regard the removable memory device as a file system.

5 In order that the present invention be more readily understood, an embodiment thereof will now be described by way of example with reference to the accompanying drawings which shows a diagrammatic representation of a digital device fitted with a removable memory receiver according to the present invention.

10 The preferred embodiment of the present invention will be described in relation to the use of an SD card to provide a broadcast radio receiver facility for a portable device such as a mobile phone or PDA. This is a typical example and it will be appreciated that the invention is of broader scope than this and will allow a number of different facilities to be provided.

15 Referring now to the drawing, it is assumed that the basic apparatus is, for example, a PDA 10 which is already provided with an SD card slot 11 for receiving an SD memory card 12. It is also assumed that the PDA will have a display 14 and also an input/output facility 15.

Since an SD card slot 11 is already provided, a CPU 16 of the PDA already
20 has a file handling facility for interfacing with the SD card slot 11 in view of the fact that conventional SD cards simply contain files. The CPU is thus able to open and close files as well as read from and write to files in an SD card loaded into the card slot.

If we now assume that a modified SD card 12 is loaded into the card slot 11
25 and the modified card contains I/O functions, the present embodiment proposes to map all these functions into a series of simple file system calls as identified above. Thus, applications can be written that are very easily ported from one platform to

another even if different operating systems are used in the basic platforms. This is because the applications only regard the SD card 12 as a file system.

In the present example where a digital radio is implemented on an SD card, the SD card can include a controller that translates file system calls into commands for the hardware. For example, when a user wishes to utilise the broadcast radio receiver facility on a PDA, the appropriate SD card is loaded into the card slot in the PDA which results in the PDA recognising that a card is present and downloading a file relating to the type of card. This causes a radio icon to appear on the display of the PDA. When the user selects the radio icon, this results in the CPU sending a file call(e.g. open ("radio")) to the SD card. The controller on the SD card translates this (e.g. open ("radio")) call as an instruction to switch on the radio receiver. As the card is now connected to the PDA power source which causes the radio receiver on the card to find all stations it can receive and create files containing the names of all such stations. Once the radio has been successfully "opened" various top level information can be obtained such as number of services, signal strength etc by using read() commands associated with the now opened "radio" pseudo file. In the case of changing stations, the CPU sends an (open "stations") file call to the PDA which results in the files relating to the station names to be displayed. When the user selects a desired station, this generates a (read "station 2") file call which is translated by the controller on the SD card as an introduction to tune the receiver to the station frequency representing station 2. In the case of changing the volume, when the user wishes to alter the volume it is necessary of the CPU to send a (read "volume") file call to the SD card controller and then if the user wishes to increase the volume the CPU will send a (read "volume") call to the SD card controller which will be interpreted by the controller as a request to increase the volume.

If this is arranged to be done in a stepwise fashion, it may be necessary to send more than one (read "volume") file call. Conversely, if the user wishes to reduce the volume, the CPU of the PDA will send a (write "volume") file call to the SD card which will be interpreted by the SD card controller as a reduce volume instruction. Again, this can be done in a stepwise fashion by repeated file calls.

If one assumes that the software on the SD card is written in "C", the only modifications required to make the SD card work on a completely different PDA that also supported an SD card interface would be to change the calls to those used by the new platform's standard operating system calls to the SD card when accessing it as a normal memory card.

Preferably though, the software on the SD card should not have to change for a different host because SD cards are designed to work unmodified in a wide range of hosts, by using an industry standard filing system which will be recognised by many operating systems.

The advantage of this arrangement is that it removes a key problem for manufacturers producing new peripheral equipment since any software written to support the peripheral is very easily ported, thus increasing the ability of manufacturers to support a far wider range of end user platforms eg different PDAs such as Pocket PC or Palm OS.

In the case of a digital audio broadcast receiver, modifications to the SD card software and controller can be achieved by utilising a JAVA applet. A suitably installed JAVA applet (from the SD card or by other means) on a device such as a PDA can be executed to enable the PDA to control an SD card software radio. Additionally, it will be necessary to provide some audio output for the PDA and if this is not already built in, a speaker or speakers can be connected to the normal I/O output connection provided on PDAs. In the case of a mobile phone, it

already is provided with a speaker and so all that is required is for the CPU in the phone to forward the signals from the SD card to the audio output circuitry of the phone.

CLAIMS:

1. A method for interfacing a removable storage device with a digital product, comprising providing the product with a digital processor and a file command structure,
 - 5 providing a removable storage device with circuitry for carrying out a predetermined function, the circuitry including a further processor, the further processor to create a plurality of files each relating to a sub-function of the predetermined function,
 - 10 creating a table of the plurality of files, receiving file commands from the digital processor and using the table of files to translate a file command into a sub-function whereby to control the predetermined function.
- 15 2. A method according to claim 1; wherein the file command structure includes the commands open, close, read and write.
3. A system according to claim 1 or 2, wherein the files created in the removable storage device relate to a digital radio receiver.
- 20 4. A system according to claim 3, wherein the file includes files relating to the transmission frequencies of stations received by the receiver.
5. A system according to claim 3 or 4, wherein the files include files relating
25 to the volume of the received signal.

6. A removable storage device for use with main apparatus comprising a processor and circuitry for performing a specified function, means for generating files relating to the specified function, means for receiving file calls from the main apparatus, translation means for translating file calls into sub-functions commands of the specified function using the generated files, and means for inputting the sub-function command to the processor.
- 5
7. A device according to claim 6, wherein the specified function is a digital radio receiver.
- 10
8. A device according to claim 6 or 7, wherein the device is configured as an SD card.

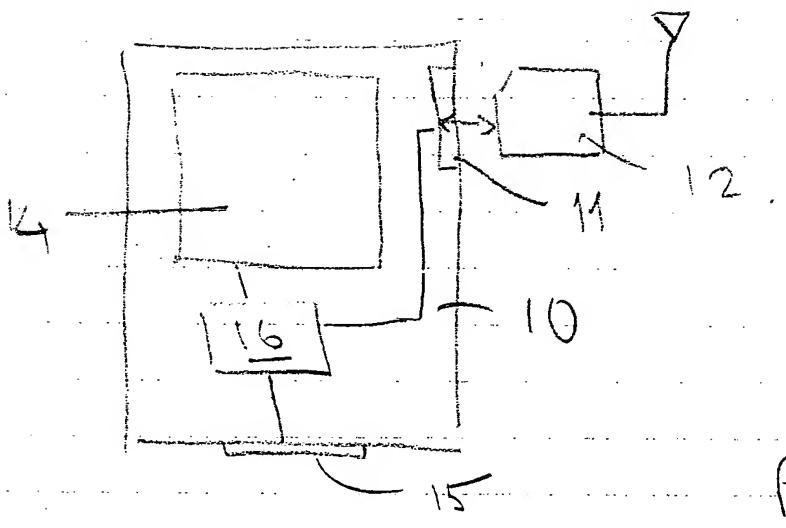


Fig. 1



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